Amendments to the Specification:

-Please delete the present Specification and insert therefore the following (clean version):

DRILLING FLUID BUCKET AND METHOD

BACKGROUND OF THE INVENTION

This invention relates to an apparatus and method for collecting a drilling fluid. More particularly, but not by way of limitation, this invention relates to an apparatus and method for collecting a drilling fluid contained within a work string on a drilling rig floor.

In the drilling of wells, and in particular, oil and gas wells, it is necessary to drill a bore hole with use of a tubular work string and boring device. The boring device is generally a bit. A fluid is used in the drilling of the bore hole. The drilling fluid has many purposes including but limited to the pressure control of subterranean reservoir pressures, bit lubrication, and lifting bore hole cuttings.

In the course of drilling a well, it becomes necessary to lift the work string from the well bore. Under some circumstances, as the operator is pulling the work string from the well bore, the work string may contain, within the inner diameter portion, the fluid. This may be referred to as pulling a wet string. As readily understood by those of ordinary skill in the art, in the process of tripping the work string from the hole, and once a thread connection is undone, the drilling fluid spills out onto the drill floor. From the drill floor, the fluid may be directed to the mud tanks, but may fall off of the rig, and out into the environment. Many times, the drilling fluid may contain harmful and caustic materials. Sometimes, the drilling fluid contains toxic

materials. In any case, the prevention of the fluid spillage is important for health, safety and environmental reasons. Under some instances, the prevention of spillage is required by law.

Several prior art bucket devices have been proposed. However, all prior art devices suffer from certain problems. For instance, a proper seal is not formed. Also, prior art devices have inadequate closing and latching mechanisms. Hence, there is a need for an apparatus for efficiently and effectively collecting fluids from work strings. There is also a need for an apparatus and method that will dependably open and close at the direction of the operator. These, as well as many other needs, will be met by the invention, which will become apparent from a reading of the following description.

SUMMARY OF THE INVENTION

An apparatus for preventing the spillage of drilling fluid onto a drilling rig floor is disclosed. The apparatus comprises a first and second sleeve, and wherein the first and second sleeve form a cylindrical member. The apparatus further includes a closing member operatively attached at a first end to the first sleeve and operatively attached at a second end to the second sleeve, wherein the closing member is pneumatically operated.

The apparatus further comprises a latching member that latches the first sleeve and second sleeve, and a seal means positioned along a first face on the first sleeve that cooperates with a sealing surface along a second face on the second sleeve.

The apparatus may further consist of a plurality of closing members operatively attached at a first end to the first sleeve and operatively attached at a second end to the second sleeve, wherein the closing members are pneumatically operated. In one embodiment, the latching

member is a plurality of latching members, and wherein the latching members latch the first and second sleeve together. Additionally, the apparatus may include a seal lip positioned along the first sleeve and covering the second sleeve in order to prevent the contents of the bucket from leaking.

In one of the preferred embodiments, the latching member is a pneumatically operated piston contained within a cylinder and wherein the cylinder is attached to a first hook and the piston is attached to a second hook, wherein the first and second hooks cooperate with a fastener to latch the first and second sleeves together. The closing member of one of the preferred embodiments may comprise a first bracket attached to the first sleeve, a second bracket attached to the second sleeve, and a pneumatically operated piston contained within a cylinder and wherein the cylinder is attached to the first bracket and the second bracket is attached to the piston.

The seal means, in one preferred embodiment, comprises a longitudinal seal strip inserted into a first groove formed on the first face and a sealing face formed on the second face. The longitudinal seal strip and the seal face may be constructed of an elastomer. In one of the most preferred embodiments, the longitudinal seal strip contains a head portion and wherein the seal face comprises a complimentary enlarged portion that receives the head portion to provide a seal.

In another preferred embodiment, the latching members comprise a cylinder having a pneumatically responsive rod therein; a first hook connected to a first end of the cylinder and wherein the first hook is pivotly attached to the second sleeve; a second hook connected to the rod and wherein the second hook is pivotly attached to the second sleeve; and wherein, as air pressure is supplied to the cylinder, the rod expands and causes pivoting of the first hook to

engage a first shoulder on the second sleeve, and the cylinder causes pivoting of the second hook to engage a second shoulder on the second sleeve.

A method of preventing spillage of a drilling fluid onto a drilling rig floor is also disclosed. The method comprises providing a drilling fluid bucket, and wherein the bucket comprises: a first and second sleeve that together form a cylindrical member; a pneumatically operated closing member operatively attached to the first and second sleeve; a latching member that latches the first and second sleeve together; and, a seal means positioned along a first face on the first sleeve that cooperates with a sealing surface positioned along a second face on the second sleeve. The method further includes surrounding the first and second tubular on the rig floor with the bucket and activating the pneumatic pistons of the closing member.

The method further includes pivoting the first and second sleeve so that a cylindrical container encapsulates the connection of the first tubular and second tubular. Next, a seal is formed, and wherein the step of forming a seal includes compressing the first seal against the seal face. The first tubular and second tubular can be disconnected. The drilling fluid from the first and second tubular is collected within the bucket and then directed from the bucket for proper disposal.

In one of the preferred embodiments, the bucket further comprises a pneumatically operated latching member and the step of pivoting the first and second sleeve further comprises activating the latching member and latching the first and second sleeve. Additionally, the bucket may comprise a seal lip along the hinged point, and wherein the step of forming a seal includes sealing the hinged point with the seal lip covering the hinged pivot seam.

In one embodiment, the bucket further comprises a pneumatically operated latching member and the step of pivoting the first and second sleeve further comprises activating the

latching member, wherein the latching member comprises a cylinder having a pneumatically responsive rod therein; a first hook connected to a first end of the cylinder and wherein the first hook is pivotly attached to the second sleeve; a second hook connected to the rod and wherein the second hook is pivotly attached to the second sleeve. Next, the rod is expanded with the air pressure supplied to the cylinder, which in turn causes the pivoting of the first hook to engage a first shoulder on the second sleeve. The method further includes moving the cylinder with the air pressure which in turn causes pivoting of the second hook to engage a second shoulder on the second sleeve thereby latching the first and second sleeves together.

An advantage of the present invention is the double closure mechanism - the first being the closure member and the second being the latching member. An advantage of the present invention also includes that once the sleeves are closed and latched about the work string, the apparatus prevents spillage of fluid. Another advantage is that the apparatus is pneumatically operated. Yet another advantage is that the pneumatic operation allows for rapid control responses. Still yet another feature is that the closing and latching, as well as the unlatching and opening, is automatically controlled.

A feature of the present invention includes use of an air cylinder and piston to control the opening and closing of the sleeves. Another feature includes use of an air cylinder and piston for the latching and unlatching of the two sleeves together. Still yet another feature is the first longitudinal seal means that seals the jaw portion of the apparatus. Yet another feature is the second longitudinal seal lip that seals the hinge pivot seam of the apparatus. Another feature is that a preferred embodiment of the seal means includes a first seal face that has an enlarged portion that fits into a reciprocal groove on a second seal face. Another feature is the latching

mechanism that uses the pneumatic cylinders and pistons to pivot hooks into engagement with a cooperating shoulder for latching the sleeves together.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1A is an isometric view of the apparatus of the present invention shown with the sleeves in the open position.

FIGURE 1B is an isometric view of the apparatus shown in FIGURE 1A with the sleeves in the closed position.

FIGURE 2A is an isometric rear view of the apparatus shown in FIGURE 1A with the sleeves in the opened position.

FIGURE 2B is an isometric rear view of the apparatus shown in FIGURE 1B with the sleeves in the closed position.

FIGURE 3A is a cross section view of the apparatus of the present invention taken along line 3A-3A in FIGURE 2A.

FIGURE 3B is a top view of the inserts of the apparatus.

FIGURE 3C is a side view of the inserts seen in FIGURE 3B.

FIGURE 4 is a cross section view of the apparatus of the present invention taken along line 4-4 in FIGURE 2B.

FIGURE 5 is a schematic illustration depicting a first and second tubular positioned within the apparatus of the present invention.

FIGURE 6 is a schematic illustration of the apparatus seen in FIGURE 5 with the sleeves closed about the tubulars.

FIGURE 7A is a cross section view of a second embodiment of the present invention depicting a preferred embodiment of the longitudinal seal means.

FIGURE 7B is the embodiment seen in FIGURE 7A with the sleeves in the closed position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig.1A, an isometric view of the apparatus 2 of the present invention is shown with the apparatus 2 being in the open position. More specifically, the apparatus 2 contains a first sleeve 4 and a second sleeve 6. The sleeves 4 and 6 are essentially half cylindrical members, and when the half cylindrical members are coupled together, the sleeves 4, 6 form a cylindrical member. The sleeve 4 and the sleeve 6 are joined together along a hinge pivot seam denoted by the numeral 8.

Fig. 1A depicts a plurality of closing members including closing member 10, closing member 12, closing member 14, and closing member 16. The closing member 10 consist of a bracket 18 that is connected to the sleeve 4 via conventional means such as welding, and the bracket is attached to a piston assembly 20. The closing member 12 consist of a bracket 22 that is connected to the sleeve 4 via conventional means such as welding, and the bracket 22 is attached to a piston assembly 24. The closing member 14 consist of a bracket 26 that is connected to the sleeve 4 via conventional means such as welding, and the bracket 26 is attached to a piston assembly 28. The closing member 16 consist of a bracket 30 that is connected to the sleeve 4 via conventional means such as welding, and the bracket 30 is attached to a piston

assembly 32. The piston assemblies comprise a piston and cylinder as will be more fully explained later in the application.

Fig. 1A also depicts the latching member 34 and the latching member 36. The latching members latch the first sleeve 4 and the second sleeve 6 together. More specifically, the latching member 34 comprises a rod 38 and cylinder 40, and wherein the rod 38 is connected to a hook 42 and the cylinder 40 is connected to the hook 44. The latching member 36 comprises a rod 46 and cylinder 48, and wherein the rod 46 is connected to a hook 50 and the cylinder 48 is connected to the hook 52. In the preferred embodiment, cylinders 40 and 48 are not attached to the sleeve 6.

A plurality of shoulders are disposed on sleeve 4. More specifically, the pair of shoulders 54, 56 are attached to the sleeve 4 and will cooperate with the hooks 42, 44 so that the sleeve 4 is latched to sleeve 6. The pair of shoulders 58, 60 are also attached to the sleeve 4 and will cooperate with the hooks 50, 52 so that sleeve 4 is latched to sleeve 6. As seen in Fig. 1A, each shoulder contains an angled extension.

Note that the hook 42, hook 44, hook 50, and hook 52 are also pivotly attached to the sleeve 6 via pin means; hook 42 pivots at 42a; hook 44 pivots at 44a; hook 50 piovots at 50a; and hook 52 pivots at 52a. Additionally, the latching members are pivotly connected to the hooks. More specifically, the cylinder 40 is pivotly attached to the hook 44 at 44b; rod 38 is pivotly attached to hook 42 at 42b. The cylinder 48 is pivotly attached to the hook 52 at 52b; rod 46 is pivotly attached to hook 50 at 50b. As air is supplied to cylinder 40, rod 38 extends as well as the cylinder 40, since the hooks 42, 44 are pivotly attached to the sleeve 4 at 42a, 44a. Hence, the rod 38 acts against hook 42 at pivot point 42b which in turn piovts the hook 42 at pivot point 42a; the cylinder 40 acts against hook 44 at piovt point 44b which in turn pivots the hook 44 at pivot point 44a. The hook 42 latches shoulder 56 and the hook 44 latches shoulder 54. The

same mechanism applies for latching member 36. As air is supplied to cylinder 48, rod 46 extends as well as the cylinder 48, since the hooks 50, 52 are pivotly attached to the sleeve 4 at 50a, 52a. Hence, rod 46 acts against hook 50 at pivot point 50b which in turn pivots the hook 50 at pivot point 50a,; the cylinder 48 acts against hook 52 at pivot point 52a. The hook 50 latches shoulder 60 and hook 52 latches shoulder 54.

A rim 61a is provided on sleeve 4 and a rim 61b is provided on sleeve 6. When the sleeves 4, 6 are closed, the rims 61a, 61b will abut the work string and in effect encapsulate the work string, which in turn forms the bottom of the bucket.

Fig. 1A also depicts the longitudinal seal means 62. The seal means 62 is on the sleeve face 64 of sleeve 6. Also, the sealing surface 66 is on the sleeve 4. Hence, the seal means 62 will abut to and seal with the sealing surface 66 when the sleeves 4, 6 are latched together. Also shown is the supply means 69 for supplying the pressurized air via pneumatic line 69a to the cylinders 40, 48 through valve V2 and for supplying the pressurized air via pneumatic line 69b to the piston assemblies 20, 24, 28, 32, through the valve V1. Valves V1 and V2 can be manual valves controlled by the operator so that air pressure can be selectively supplied to either pneumatic line 69a or pneumatic line 69b.

Referring now to Fig. 1B, which is an isometric view of the apparatus 2 shown in Fig. 1A, the sleeves 4, 6 are shown in the closed position. It should be noted that like numbers appearing in the various figures refer to like components. Hence, the piston assemblies 20, 24, 28, and 32 have been activated and extended via supply means 69. More specifically, the rod 70 extends from piston assembly 20, the rod 72 extends from piston 24 assembly, the rod 74 extends from piston assembly 28, and the rod 76 extends from piston assembly 32. The rod 70 is attached to the bracket 18, the rod 72 is attached to the bracket 22, the rod 74 is attached to the

bracket 26 and the rod 76 is attached to the bracket 30. Thus, by extending the rods (70, 72, 74, 76), the brackets (18, 22, 26, 30) will in turn cause the sleeve 4 to pivot along the hinge pivot seam 8 thereby closing the apparatus 2.

Additionally, the operator will then activate the latching members 34, 36 via the supply line 69a. In the position shown in Fig. 1B, the seal means 62 will cooperate with the sealing surface 66 to seal the sleeves 4, 6 in order to prevent spillage. Note that the rims 61a, 61b also prevent spillage and will have an elastomer member attached to the rims 61a, 61b in order to engage the work string.

Fig. 2A is an isometric rear view of the apparatus 2 shown in Fig. 1A with the sleeves 4, 6 in the opened position. Note that the hinge pivot seam 8 is shown. Additionally, the hinges 78, 80, 82, 84 and 86 are shown. Fig. 2A also depicts the fluid outlet 87 for directing the drilling fluid from the bucket. Also shown in Fig. 2A is the bracket 88 that is connected to cylinder 20; bracket 90 that is connected to cylinder 24; bracket 92 that is connected to cylinder 28; and bracket 94 that is connected to cylinder 32.

Referring now to Fig. 2B, an isometric rear view of the apparatus 2 shown in Fig. 1B with the sleeves 4, 6 in the closed position will now be described. Hence, in this position, the operator has caused the extension of the rods 70, 72, 74, and 76 via pneumatic pressure which in turn will act in conjunction with the brackets 18, 22, 26, 30, of the sleeve 4 and brackets 88, 90, 92, and 94 of the sleeve 6. Thus, the sleeves 4, 6 will close, as seen in Fig. 2B, with the application of pneumatic pressure from the supply means 69 (as seen in Figs. 1A and 1B).

In Fig. 3A, a cross section view of the apparatus 2 of the present invention taken along line 3-3 in Fig. 2A will now be described. The sleeves 4 and 6 are open. The rod 70 is disposed within the cylinder 20. The seal means 62 is shown disposed within the face 64, and more

particularly, within the groove 96. The seal means 62 will cooperate with the seal face 66 in order to provide a seal when the sleeves 4, 6 are closed. A second embodiment of the seal means will be described in the discussion of Figs. 7A and 7B.

Fig. 3A also depicts the seal lip 98, and wherein in the preferred embodiment the seal lip 98 extends the entire length apparatus. The seal lip 98 is an elastomer member that covers and seals the hinge pivot seam 8 when the apparatus 2 is closed. The latching member 34 is also shown.

Fig. 3A also depicts an embodiment of a screen that can be included. Fig. 3A depicts screen 100 which consist of a first mesh part 102 and a second mesh part 104 that are connected together at the hinge 106. One end of the first mesh 102 is connected via a hinge 108 to the brace 110 and wherein the brace 110 is connected to the bracket 18. One end of the second mesh 104 is connected via a hinge 112 to the brace 114. The purpose of the safety screen 87 is to prevent a a person on the drill floor from coming into contact with the closing member cylinders, such as cylinder 20.

Fig. 3B is a top view of the inserts 61c, 61d, wherein the inserts 61c, 61d are configured to fit into the rims 61a, 61b, respectively. The inserts 61c, 61d, in the preferred embodiments, are made of an elastomer. The inserts 61c, 61d will surround the tubular and engage the tubular. There will be a top pair of inserts and a bottom pair of inserts. Hence, when the sleeves of the apparatus 2 are closed, the apparatus 2 is in effect a closed container. Fig. 3C is a side view of the inserts 61c, 61d seen in Fig. 3B depicting a tongue-in-groove cooperation of the inserts upon engagement.

Fig. 4 is a cross section view of the apparatus 2 taken along line 4-4 in Fig. 2B. The sleeves 4 and 6 have been closed due to the activation of the pneumatic piston assemblies, and in

particular, the application of air pressure within the cylinder 20 via supply means 69 (seen in Figs. 1A and 1B) thereby extending the rod 70 which in turn causes the brackets 18, 88 to close the sleeves 4, 6. Fig. 4 also depicts the latching member 34 having also been activated so that the sleeves 4, 6 are latched together. As noted in the discussion of Fig. 3A, the screen 87 is also depicted wherein the mesh 102, 104 have been allowed to be extended by pivoting about the hinges 106, 108, and 112.

Referring now to Fig. 5, a schematic illustration depicting a first tubular 116 and second tubular 118 positioned within the apparatus above a rig floor will now be described. The apparatus 2 is suspended from the derrick using well known means such as shackles and slings. As is well understood by those of ordinary skill in the art, the first tubular 116 is positioned within a rotary table 120 on the rig floor, and more particularly, within a slip means 121. The first tubular 116 and second tubular 118 are threadedly connected forming a joint 122. Fig. 5 shows the apparatus 2 in the open position positioned about the tubulars 116, 118. A set of legs, namely 124, 126 is shown for supporting the apparatus 2 in the upright position on the rig floor.

Referring now to Fig. 6, a schematic illustration of the apparatus 2 seen in Fig. 5 will now be described wherein the sleeves 4, 6 have been closed about the tubulars 116, 118. More specifically, the supply means 69 (not shown in this view) has caused the sleeves to close by expanding the rods via air pressure within the cylinders, as described earlier. Then, the latching members 34, 36 will also latch the sleeves 4, 6 together via pneumatic supply to the cylinders 40, 48 thereby causing the hooks 44, 42, 52, and 50 to pivot and engage the shoulders 54, 56, 58, 60. Once closed, the seal means 62 and seal lip 98 (not seen in this view) will seal up the apparatus 2. Next, the operator can disconnect the thread connect between the tubular 118 and 116. When the tubular 116 is disconnected from tubular 118, any fluid within the tubular 116 will fall out.

The seal means 62 and seal lip 98 of the apparatus 2 will prevent leakage of the fluid onto the drill floor. Also, the rims 61a, 61b (not shown in this view), which surround and abut the tubular 118, will catch any falling fluid within the apparatus 2. The fluid from the tubular 116 will be directed out of the apparatus 2 via the outlet 87 for proper processing and disposal.

In order to disengage the apparatus 2, the operation includes releasing pressure to the latching members 34, 36 so that the hooks 42, 44, 50, 52 can be released from the shoulders 54, 56, 58, 60. In the preferred embodiment, this is a manual operation, done by the operator. The closing members 10, 12, 14, 16 will also release the pressure within their cylinders so that the sleeves 4, 6 can be separated by the operator.

Referring now to Fig. 7A, a cross section view of a second embodiment of the present invention depicting a preferred embodiment of the longitudinal seal means, that includes the first longitudinal seal means 130, will now be described. In this preferred embodiment, the sleeve 6 contains the seal groove 132 and wherein the seal groove 132 contains a dove tail profile that has a base 134 that is greater in length than the opening 136. The first seal means 130 has a base profile that cooperates with the dove tail profile of the seal groove 132 so that the first seal means 130 fits into the dove tail profile as shown in Fig. 7A. Additionally, in the preferred embodiment illustrated in Fig. 7A, the first seal means 130, which may be referred to as the male portion, has an enlarged head portion 138 that extends to a neck portion 140 that is of lesser thickness than the head portion 138. The sleeve 4 contains the reciprocal sealing face, wherein the sealing face comprises a second longitudinal seal means 142 that is contained on the face 144. The second seal means 142, which may be referred to as the female portion, contains an opening 146 that receives and cooperates with the first seal means 130. As illustrated in Fig. 7A, the opening 146 extends to an enlarged portion 148.

In the embodiment disclosed, the seal means will be an elastomeric member, and wherein due to the nature of elastomeric members, there is the ability to expand and contract. Referring now to Fig. 7B, the embodiment seen in Fig. 7A is shown with the sleeves 4, 6 in the closed position. As can be seen, the head portion 138 of the first seal means 130 has been received within the complimentary enlarged portion 148 of the second seal means 142. This forms a type of tongue in groove arrangement of the first seal means 130 cooperating with the second seal means 142 which in turn prevents spillage of the drilling fluids from the tubulars during break down of the tubular string, as previously described. Also, once the seal means become worn, it is easy to replace the seal means since the longitudinal seals can be slid out from the grooves 132, 144 and a new set inserted therein. While preferred embodiments of the present invention have been described, it is to be understood that the embodiments described are illustrative only and that the scope of the invention is to be defined solely by the appended claims when accorded a full range of equivalence, many variations and modifications naturally occurring to those skilled in the art from a review thereof.